

Spot Safety Project Evaluation

Project Log # 200501216 / 200501217

Spot Safety Project # 02-00-208 / 02-00-209

Spot Safety Project Evaluation, Of Four Directional Crossover Installations on US 70 Near Havelock, in Craven County

Documents Prepared By:

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Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Numbers 02-00-208/ 02-00-209 – The Directional Crossovers on US 70, near Havelock, in Craven County

The four treatment locations consist of the following crossovers:

Crossover 1, On US 70 near El Cerro Grande Restaurant (formerly Shoney's);

Crossover 2, On US 70 near Holiday Inn;

Crossover 3, On US 70 near Stratford Road; and

Crossover 4, On US 70 near Earthworks Garden Center

Crossovers 1 and 2 belong with Spot Safety Project Number 02-00-208.

Crossovers 3 and 4 belong with Spot Safety Project Number 02-00-209.

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis has been completed to measure the effectiveness of the spot safety improvement. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject locations was the modification of the existing median crossovers to provide channelization to prohibit left turns from the service road connections and crossing movements on US 70. In addition, the service road connection on the north side of Crossover 4 was closed off. Neil Lassiter, P.E., Division Engineer, originally requested the improvements. US 70 is a four-lane divided roadway with two travel lanes in each direction and has a speed limit of 50 mph within the vicinity of the treatment locations. A left-turn lane and a right turn lane are provided on each approach for Crossovers 2 and 3. Crossover 1 has a left-turn lane on the westbound approach and a right-turn lane on the eastbound approach. Crossover 4 has a left-turn lane on the eastbound approach and a right-turn lane on the westbound approach. The service road connections at each crossover are two-lane roadways under stop sign control.

Lack of control at the median openings resulted in cars stacked in the median and caused multiple crashes. It was felt the improvements would provide safer movements for motorists. The initial crash analyses for these locations were completed from September 1, 1996 through August 30, 1999. According to the initial analysis, Crossovers 1 and 2 experienced a total of 20 reported crashes (including 16 Correctable Crashes). There were eight Left-Turn Crashes and eight Angle

Crashes resulting in five class A injuries, three class B injuries, and nine class C injuries. Crossovers 3 and 4 experienced a total of 21 reported crashes (including 19 Correctable Crashes). There were 15 Left-Turn Crashes and four Angle Crashes resulting in two class A injuries, 13 class B injuries, and nine class C injuries. Please note that the initial crash analyses used to justify the improvements differ from the crash analyses used in this evaluation. The final completion date for the improvements at the subject intersections was on September 28, 2001.

Naïve Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject locations, the crash data omitted from this analysis to consider for an adequate construction period was from August 1, 2001 through November 30, 2001. The before period consisted of reported crashes from August 1, 1998 through July 31, 2001 (3 Years) and the after period consisted of reported crashes from December 1, 2001 through November 30, 2004 (3 Years). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

Tables 1 and 2 depict the Naïve Before and After Analysis for the Treatment Locations and for intersections influenced by the Treatment Locations. The treatment data consists of crashes within 150 feet from each Treatment Location, excluding those crashes solely involving vehicles on the service road. In order to test for crash migration, naïve before and after analyses were also performed at three signalized intersections* located within the vicinity of the Treatment Locations and on the section of US 70 within the treatment influence area.

The intersections potentially influenced by the Treatment Locations are as follows:
Intersection A, US 70 at SR 1764-SR 1765-Catawba Road-Greenfield Heights Blvd;
Intersection B, US 70 at SR 1757-Ketner Blvd; and
Intersection C, US 70 at Stonebridge Trail.

The section on US 70 that was additionally analyzed is from 150' north of US 70 at SR 1764-SR 1765-Catawba Road-Greenfield Heights Blvd to 150' south of SR 1778-Service Road. Please see attached *Location Map* for further detail.

Table 1 contains the Naïve Before and After Analysis for each Treatment Crossover and each Influenced Intersection broken down by location. In addition, the Naïve Before and After Analysis for the section of US 70 within the treatment influence area is also provided. Table 2 contains the overall crash summary for the Treatment Crossovers, the Influenced Intersections, and the US 70 Strip. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle. The before period ADT year was 2000, and the after period ADT year was 2003.

**Please note that the intersections of US 70 at SR 1764-SR 1765-Catawba Road-Greenfield Heights Blvd and US 70 at SR 1757-Ketner Blvd were signalized for the entire duration of the Before and After time periods. The intersection of US 70 at Stonebridge Trail, however, has only been signalized since the beginning of the After time period.*

Table 1. Crash Breakdown by Intersection

Treatment Crossovers	Before	After	Percent Reduction (-)/ Percent Increase (+)
Crossover 1	2	2	0.0
Crossover 2	5	2	-60.0
Crossover 3	3	1	-66.7
Crossover 4	3	2	-33.3
Total Treatment	13	7	-46.2
Influenced Intersections			
Intersection A	5	31	520.0
Intersection B	5	9	80.0
Intersection C	3	7	133.3
Total Influenced Intersections	13	47	261.5
US 70 Section	28	69	146.4

Table 2. Overall Crash Summary

Treatment Crossovers			
	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	13	7	- 46.2
Total Severity Index	22.48	2.06	- 90.8
Frontal Impact Crashes	8	4	- 50.0
Frontal Impact Severity Index	34.05	2.85	- 91.6
Volume	23,800	26,500	11.3
Influenced Intersections			
	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	13	47	261.5
Total Severity Index	6.12	4.66	- 23.9
Frontal Impact Crashes	7	11	57.1
Frontal Impact Severity Index	7.34	5.71	- 22.2
Volume	24,500	27,600	12.7

US 70 Section

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	28	69	146.4
Total Severity Index	13.61	4.35	- 68.0
Frontal Impact Crashes	15	16	6.7
Frontal Impact Severity Index	21.59	4.7	- 78.2
Volume	23,500	26,000	10.6

The naïve before and after analysis at the Treatment Crossovers resulted in a 46.2 percent decrease in Total Crashes, a 90.8 percent decrease in the Total Severity Index, and an 11.3 percent increase in Average Daily Traffic (ADT). The Influenced Intersections experienced a 261.5 percent increase in Total Crashes, a 23.9 percent decrease in the Total Severity Index, and a 12.7 percent increase in ADT. The US 70 Strip within the Treatment Influence Area experienced a 146.4 percent increase in Total Crashes, a 68.0 percent decrease in the Total Severity Index, and a 10.6 percent increase in ADT. The before period ADT year was 2000, and the after period ADT year was 2003.

Results and Discussion

The naïve before and after analysis at the Treatment Crossovers resulted in a 46.2 percent decrease in Total Crashes and a 50.0 percent decrease in Frontal Impact Crashes. Analysis of the treatment locations also resulted in a substantial decrease in the Total Severity Index (- 90.8%) and the Frontal Impact Severity Index (-91.6%). The number of Fatal and Class A injuries decreased from eight in the before period to none in the after period. These results demonstrate that the treatment locations appear to have had an overall decrease in the number and severity of crashes from the before to the after period.

Although the number and severity of crashes has decreased at the treatment locations, the effect of the treatment on surrounding intersections and on US 70 as a system must remain in consideration during analysis. The naïve before and after analysis of the three nearby intersections resulted in an increase in crashes. As a whole, the intersections experienced a 261.5 percent increase in Total Crashes and a 57.1 percent increase in Frontal Impact Crashes. The section on US 70 that was analyzed displayed a 146.4 percent increase in Total Crashes and a 6.7 percent increase in Frontal Impact Crashes. A majority of crashes on this section were concentrated at the treatment locations and the three signalized intersections.

The increase in the number of crashes from the before to the after period for the surrounding signalized intersections may be attributed to the installation of the directional crossovers at the treatment locations. The raised islands constructed in the crossovers prevent through and left turn movements from the service road connections. Therefore, motorists wishing to turn left onto US 70 from the service road will need to access US 70 from the nearest signalized intersection to the north or south (i.e. potential crash migration occurs). The additional traffic volume accessing US 70 from the signalized intersections may have contributed to the increase in the number of Total and Frontal Impact Crashes.

In addition, possible U-turn type crashes at the signalized intersections were examined. These crashes also had the potential to increase in the after period because of the movements prohibited at the treatment location. Possible U-turn crashes involved either Rear-End Crashes in the left-turn lane of US 70 or involved conflict between left-turning vehicles on US 70 and right turning vehicles from the side street. There was no increase in the number of crashes involving U-turns at the signalized intersections.

Please see the attached *Treatment Site Location Photos*. Photos are provided for each Treatment Crossover. In addition, photos taken at the three signalized intersections in the vicinity of the Treatment Locations are provided.

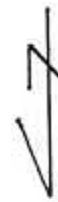
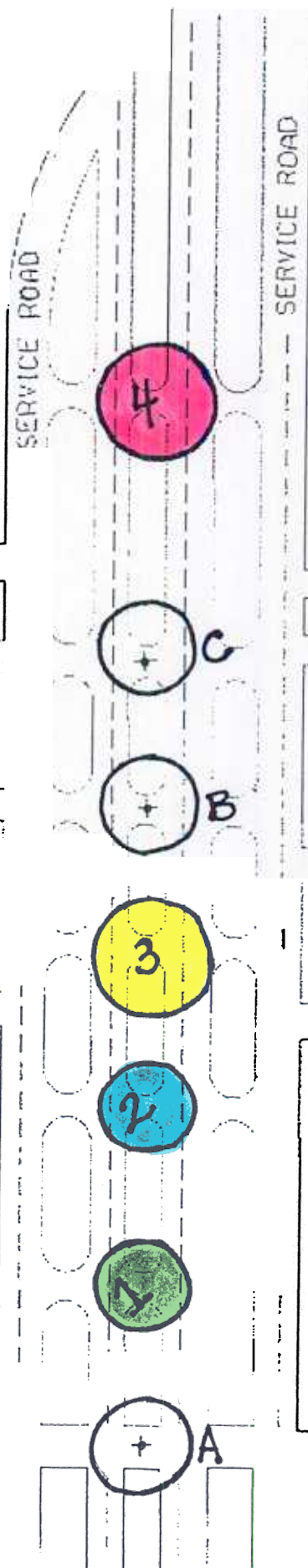
The summary results above demonstrate that in the naïve before and after analysis method the treatment location appears to have had a crash reduction from the before to the after period. However, when looking at the 1.3-mile strip surrounding the Treatment Locations, there is an increase in crashes. Although the surrounding signalized intersections displayed an increase in crashes, it is not conclusive that the treatment had a negative effect on them.

The countermeasure crash reduction for Total Crashes at the subject crossovers is a 46.2 percent decrease in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection is a 50.0 percent decrease in crashes. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors.

Location Map
SS 02-00-208 / 02-00-209
Near Havelock, Craven County

SHOPPING MALL

OPEN
STONEBRIDGE RD.
KETNER RD.
STAFFORD RD.
HOLIDAY INN
SHONEY'S
GREENFIELD RD.



OFFICES (8 UNITS)

Treatment Site Photos (Taken on May 3, 2005)



Looking north on US 70 at Crossover 4



Looking south on US 70 at Crossover 4

Treatment Site Photos (Taken on May 3, 2005)



Looking north on US 70 at Crossover 3



Looking south on US 70 at Crossover 3

Treatment Site Photos (Taken on May 3, 2005)



Looking north on US 70 at Crossover 2



Looking south on US 70 at Crossover 2

Treatment Site Photos (Taken on May 3, 2005)



Looking north on US 70 at Crossover 1



Looking south on US 70 at Crossover 1

Treatment Site Photos (Taken on May 3, 2005)



Photos taken while driving north on US 70
Top: US 70 at SR 1746-SR 1765-Catawba Road-Greenfield Heights Blvd
Middle: US 70 at SR 1757-Ketner Blvd
Bottom: US 70 at Stonebridge Trail